

- 45 -

CLAIMS

1. A method for joining pipe-shaped articles, comprising:

5 butting pipe-shaped articles comprising a resin member by abutting respective end parts thereof together directly or through a flange comprising a resin member or by inserting the end parts into a fitting comprising a resin member, or in this abutment or insertion, while disposing a laser light absorber between the 10 end parts of the pipe-shaped articles or between the end part(s) of the pipe-shaped article(s) and the flange or fitting,

15 at least one end part of the pipe-shaped articles or the flange or fitting comprising a resin member with a transparency to laser light,

20 at least one end part of the pipe-shaped articles or the flange, fitting or laser light absorber comprising a resin member with an absorbency for laser light, and

25 irradiating laser light on a portion contacted by the end part of the pipe-shaped articles, the flange, the fitting and/or the laser light absorber, thereby laser-welding them.

2. The method for joining pipe-shaped articles as claimed in claim 1, which is a method of joining pipe-shaped articles through a fitting, wherein the pipe-shaped articles are joined by either one of the following methods:

30 (A) a pipe-shaped article comprising a resin member having absorbency for laser is inserted into a fitting comprising a resin member having transparency to laser light, and laser light is irradiated from said fitting side, thereby laser-welding the pipe-shaped article and the fitting; or

35 (B) a laser light absorber is disposed on the outer surface of a pipe-shaped article comprising a resin member having transparency to laser light, said pipe-

shaped article is inserted into a fitting comprising a resin member having transparency to laser light, and laser light is irradiated from said fitting side, thereby laser-welding the pipe-shaped article and the fitting.

5 3. The method for joining pipe-shaped articles as claimed in claim 1, which is a method of joining pipe-shaped articles through a flange, wherein the pipe-shaped articles are joined by any one of the following methods:

10 (C) the end parts of pipe-shaped articles comprising a resin member having transparency to laser light are butted together through a flange comprising a resin member having absorbance for laser light while applying a pressure, and laser light is irradiated from the end part sides of the pipe-shaped articles, thereby 15 laser-welding the end parts;

20 (D) the end parts of pipe-shaped articles comprising a resin member having absorbency for laser light are butted together through a flange comprising a resin member having transparency to laser light while applying a pressure, and laser light is irradiated from the flange side, thereby laser-welding the end parts;

25 (E) the end parts of pipe-shaped articles comprising a resin member having transparency to laser light are butted together through a flange comprising a resin member having transparency to laser light while applying a pressure in the state that a laser light absorber is disposed at the abutting parts between said flange and said pipe-shaped articles, and laser light is irradiated from the end part sides of the pipe-shaped 30 articles, thereby laser-welding the end parts; or

35 (F) the end parts of pipe-shaped articles comprising a resin member having transparency to laser light are butted together through a flange comprising a resin member having transparency to laser light while applying pressure in the state that a laser light absorber is disposed at the abutting parts between said flange and said pipe-shaped articles, and laser light is

irradiated from the flange side, thereby laser-welding the end parts.

4. The method for joining pipe-shaped articles as claimed in claim 1, which is a method of joining end parts of pipe-shaped articles with each other, wherein the pipe-shaped articles are joined by any one of the following methods:

5 10 (G) the end part of a first pipe-shaped article comprising a resin member having transparency to laser light, with the inner surface of the end part having a tapered joining face, and the end part of a second pipe-shaped article comprising a resin member having absorbency for laser light, with the outer surface of the end part having a tapered joining face matching the tapered joining face of the end part of said first pipe-shaped article, are abutted together, and laser light is irradiated from said first pipe-shaped article side, thereby laser-welding the joining faces to each other; or

15 20 (H) the end part of a first pipe-shaped article comprising a resin member having transparency to laser light, with the inner surface of the end part having a tapered joining face, and the end part of a second pipe-shaped article comprising a resin member having transparency to laser light, with the outer surface of the end part having a tapered joining face matching the tapered joining face of the end part of said first pipe-shaped article, in which a laser light absorber is disposed on said tapered joining face, are 25 abutted together, and laser light is irradiated from said first pipe-shaped article side, thereby laser-welding the joining faces to each other.

30 35 5. The method for joining pipe-shaped articles as claimed in claim 2 wherein, in joining pipe-shaped articles by the method of (A), the pipe-shaped articles comprise an outer layer comprising a resin member having absorbency for laser light and an inner layer comprising

a resin member having transparency to laser light.

6. The method for joining pipe-shaped articles as claimed in claim 5, wherein the thickness of the outer layer is from 10 to 1,000 μm .

5 7. The method for joining pipe-shaped articles as claimed in any one of claims 1 to 7, wherein the laser light absorber is a colorant having absorbency for laser light.

10 8. The method for joining pipe-shaped articles as claimed in claim 7, wherein the laser light absorber is a film comprising a resin member containing a colorant having absorbency for laser light.

15 9. The method for joining pipe-shaped articles as claimed in claim 8, wherein the thickness of the film is from 10 to 1,000 μm .

10. The method for joining pipe-shaped articles as claimed in any one of claims 2 to 9, wherein the first pipe-shaped article, fitting or flange comprises a resin member having weak absorbency for laser light.

20 11. The method for joining pipe-shaped articles as claimed in claim 10, wherein the resin member comprises a resin and an additive having weak absorbency for laser light.

25 12. The method for joining pipe-shaped articles as claimed in claim 11, wherein the additive having weak absorbency has a transmittance of 40 to 90% for laser light.

30 13. The method for joining pipe-shaped articles as claimed in claim 12, wherein the additive having weak absorbency is at least one member selected from ethylene and/or propylene-based copolymers, styrene-based copolymers, modified ethylene and/or propylene-based copolymers and modified styrene-based copolymers.

35 14. The method for joining pipe-shaped articles as claimed in claim 10 wherein, in the resin member, an additive having absorbency for laser light is incorporated in the resin within a range of not allowing

melting of the resin even when laser light is absorbed.

15. The method for joining pipe-shaped articles as
claimed in claims 1 to 14, wherein the resin member
constituting the pipe-shaped article and fitting
comprises a polyamide resin or a polyamide resin
composition mainly comprising polyamide.

16. The method for joining pipe-shaped articles as
claimed in claims 1 to 15, wherein the pipe-shaped
article is a fuel pipe for automobiles, an air brake pipe
for automobiles, a chemical liquid-transporting pipe or a
fuel gas-supplying or transporting pipe.